

NOMENCLATURAL INNOVATIONS IN *PHLOX* (POLEMONIACEAE),
WITH UPDATED CIRCUMSCRIPTION OF
P. CAESPITOSA, *P. DOUGLASII*, *P. MISSOULENSIS*, AND *P. RICHARDSONII*

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ABSTRACT

In preparation for a forthcoming manuscript on *Phlox*, seven nomenclatural innovations are made: ***Phlox austromontana*** Coville subsp. ***jonesii*** (Wherry) Locklear, comb. et stat. nov.; ***Phlox austromontana*** subsp. ***lutescens*** (S.L. Welsh) Locklear, comb. et stat. nov.; ***Phlox condensata*** subsp. ***covillei*** (E.E. Nelson) Locklear, comb. et stat. nov.; ***Phlox pilosa*** L. subsp. ***longipilosa*** (Waterf.) Locklear, comb. et stat. nov.; ***Phlox richardsonii*** Hook. subsp. ***borealis*** (Wherry) Locklear, comb. nov.; ***Phlox subulata*** L. subsp. ***setacea*** (L.) Locklear, comb. et stat. nov.; ***Phlox villosissima*** subsp. ***latisepala*** (Wherry) Locklear, comb. nov. Taxonomic circumscriptions of *P. caespitosa*, *P. douglasii*, and *P. richardsonii* are provided in support of these nomenclatural changes, along with an updated circumscription of *P. missoulensis*.

RESUMEN

Se hacen siete novedades nomenclaturales en la preparación de un futuro tratamiento de *Phlox*: ***Phlox austromontana*** Coville subsp. ***jonesii*** (Wherry) Locklear, comb. et stat. nov.; ***Phlox austromontana*** subsp. ***lutescens*** (S.L. Welsh) Locklear, comb. et stat. nov.; ***Phlox condensata*** subsp. ***covillei*** (E.E. Nelson) Locklear, comb. et stat. nov.; ***Phlox pilosa*** L. subsp. ***longipilosa*** (Waterf.) Locklear, comb. et stat. nov.; ***Phlox richardsonii*** Hook. subsp. ***borealis*** (Wherry) Locklear, comb. nov.; ***Phlox subulata*** L. subsp. ***setacea*** (L.) Locklear, comb. et stat. nov.; ***Phlox villosissima*** subsp. ***latisepala*** (Wherry) Locklear, comb. nov. Se aportan las circunscripciones taxonómicas de *P. caespitosa*, *P. douglasii*, y *P. richardsonii* en apoyo de estos cambios nomenclaturales, junto con una circunscripción puesta al día de *P. missoulensis*.

Phloxes are components of a remarkably diverse array of plant communities and ecological systems across North America, and are often among the most common herbaceous species in the associations in which they occur. Examples include *Phlox diffusa* in subalpine grasslands of the Olympic Mountains, *P. muscoides* in Wyoming Basin rock outcrop communities, *P. pulvinata* in Rocky Mountain alpine fell-fields, and *P. subulata* in barrens and glades in the eastern United States.

The most recent monograph on the genus *Phlox* (Polemoniaceae) is that of Wherry (1955). A forthcoming manuscript on *Phlox* (Locklear, in prep.) requires nomenclatural changes for a number of taxa, proposed here to make these names available for the work. Four of these are changes in rank from variety to subspecies for consistency with concepts of rank in the forthcoming work and those of Wherry, who used “subspecies” in preference to “variety.” The concept of subspecies is used here to delimit population systems that exhibit geographic variation and distinctive ecological associations.

Justification for the proposed new combination of *P. condensata* subsp. *covillei* requires updated circumscriptions of *P. caespitosa* and *P. douglasii*, which are provided here. Justification for the proposed new combination of *P. richardsonii* subsp. *borealis* requires updated circumscription of *P. richardsonii*, also provided. Additionally, an updated circumscription of *P. missoulensis* is provided.

NOMENCLATURAL INNOVATIONS IN *PHLOX*

Phlox austromontana Coville subsp. ***jonesii*** (Wherry) Locklear, comb. et stat. nov. BASIONYM: *Phlox jonesii* Wherry, Notul. Nat. Acad. Nat. Sci. Philadelphia 146:8, fig. 5. 1944; *Phlox austromontana* Coville var. *jonesii* (Wherry) S.L. Welsh, Great Basin Naturalist 45:792. 1985. TYPE: UNITED STATES. UTAH. Washington Co.: Zion Canon, 07 May 1923, M.E. Jones s.n. (HOLOTYPE: US!; ISOTYPES: CAS, PH, digital image! RSA-POM, digital image!).

Phlox austromontana Coville subsp. **lutescens** (S.L. Welsh) Locklear, comb. et stat. nov. BASIONYM: *Phlox austromontana* Coville var. *lutescens* S.L. Welsh, Great Basin Naturalist 45:792. 1985; *Phlox lutescens* (S.L. Welsh) S.L. Welsh, Utah Fl. ed. 3. 494. 2003. TYPE: UNITED STATES. UTAH. Garfield Co.: T33S, R14E, SW1/4 Sec. 1, along Orange Cliffs Rd, E of hwy 95, 4500 ft elev., Rimrock – blackbrush, ash, squawbush, comm., 11 May 1983, S.L. Welsh, B. Welsh & M. Chatterley 21972 (HOLOTYPE: BRY; ISOTYPES: NY, internet image!).

In his paper on the *P. austromontana* complex, Welsh (1985) recognized four varieties—the first-described and most widespread form (var. *austromontana*) plus three intergrading expressions (vars. *jonesii*, *lutescens*, and *prostrata*) of much more limited distribution occurring in the canyon country of southern Utah and adjacent Arizona. These taxa are distinguished at the rank of subspecies because of their discrete distributions and unique ecological associations. The combination *P. austromontana* subsp. *prostrata* has been published previously (Wherry 1939).

Phlox condensata (A. Gray) E.E. Nelson subsp. **covillei** (E.E. Nelson) Locklear, comb. et stat. nov. BASIONYM: *Phlox covillei* E.E. Nelson, Revis. W.N. Amer. Phlox 15. 1899. TYPE: UNITED STATES. CALIFORNIA: Inyo Co.: Black Canon, White Mountains, 08 Jul 1891. FV. Coville with F. Funston 1801 (HOLOTYPE: destroyed by fire: CAS; NEOTYPE, designated by Wherry 1942: US!; ISOTYPES: B, GH! K, NY, internet image! PH, digital image!).

The taxonomic history of *P. condensata* is complex. Gray (1870) described *P. caespitosa* var. *condensata* from type material collected by Charles Christopher Parry in alpine habitat in the Southern Rocky Mountains of Colorado (Holotype: GH!; Isotypes: ISC NY, internet image! PH, digital image!). Elias Nelson (1899a) elevated it to species rank as *P. condensata*. Wherry (1941, 1955) reduced it to *P. caespitosa* subsp. *condensata*, but Cronquist (1959) elevated it back to species rank. As detailed in the circumscription of *P. caespitosa* that follows, *P. condensata* is treated here at the rank of species.

Elias Nelson (1899) described *P. covillei* from type material collected in the White Mountains of eastern California, and subsequent exploration of the Intermountain West revealed this entity to occur in alpine/subalpine situations in a number of other high elevation mountain ranges of the Great Basin as well as in the Sierra Nevada. Wherry (1942, 1955) affirmed recognition of this taxon at the species level, but Cronquist (1959) reduced it to synonymy under *P. condensata*. Wherry (1969) disagreed, defending recognition of *P. covillei* on the basis of morphological differences and complete geographic separation from *P. condensata* of the Rocky Mountains, but Cronquist (1984) was not convinced, noting, “I am unable to distinguish the Colorado plants from more western materials.” While morphological differences cited by Wherry are not profound (see key below), the taxon *covillei* warrants recognition as a subspecies because of its entirely separate range, a relationship paralleled in the similar bi-centric distribution pattern of the bristlecone pine complex, with the Southern Rocky Mountain expression recognized as *Pinus aristata* and the Intermountain expression as *Pinus longaeva* (Bailey 1970). *Phlox condensata* is strongly associated with bristlecone pine subalpine woodland, subsp. *condensata* with *Pinus aristata* in the Rockies of Colorado and New Mexico and subsp. *covillei* with *Pinus longaeva* in Great Basin mountain ranges in California and Nevada.

KEY TO THE SUBSPECIES OF *PHLOX CONDENSATA* (A. GRAY) E.E. NELSON

Plant composed of discrete divergent shoots; pubescence rather sparse, leaves linear-subulate, ciliate; inflorescence herbage glandular-pubescent; Southern Rocky Mountains in Colorado and New Mexico

subsp. **condensata**

Plant composed of interlacing shoots; pubescence rather copious; leaves narrow-elliptic, copiously coarse-ciliate, the margin markedly thickened; inflorescence herbage densely pubescent with coarse hairs, only some gland-tipped; Sierra Nevada of California and mountains of the Great Basin in California and Nevada

subsp. **covillei** (E.E. Nelson) Locklear

Interpreting floristic and ecological literature in relation to *P. condensata* is made difficult by the confused nomenclature surrounding this species and its subspecies. Literature pertaining to subsp. *condensata* (generally as *P. condensata*) includes these: Baker 1983; Boyce et al. 2005; Cockerell 1903; Cox 1933 (as *P. caespitosa*); Hartman & Mitchell 1979; Hartman & Rottman 1985, 1988 (as *P. pulvinata*); Kiener 1967; Langenheim 1962

(as *P. caespitosa*); Shepherd 1975 (as *P. caespitosa*); Weber & Wittmann 2001a, 2001b; Wootton & Standley 1915 (as *P. caespitosa*). Literature pertaining to subsp. *covillei* (generally as *P. covillei*) includes these: Billings & Thompson 1957; Botti & Sydoriak 2001 (as *P. condensata*); Chabot & Billings 1972; Clokey 1951; Goodrich 1981 (as *P. condensata*); Kartesz 1988; Kimball et al. 2004 (as *P. condensata*); Krantz 1994 (as *P. condensata*); Linsdale et al. 1952; Lloyd & Mitchell 1973; Major & Taylor 1977; Marchand 1973; Mooney et al. 1962; Munz 1974; Munz & Keck 1959; Nelson & Kennedy 1906 (as *P. dejecta*); Patterson & Wilken 1993 (as *P. condensata*); Peinado et al. 2005; Pemble 1970; Sharsmith 1940 (as *P. caespitosa* var. *condensata*); Spira 1991 (as *P. condensata*); Wenk & Dawson 2007 (as *P. condensata*); Wherry 1942; Wright & Mooney 1965.

Phlox pilosa L. subsp. **longipilosa** (Waterf.) Locklear, comb. et stat. NOV. BASIONYM: *Phlox longipilosa* Waterf., *Rhodora* 73:577. 1971; *Phlox pilosa* L. var. *longipilosa* (Waterf.) J. & C. Taylor, *Sida* 9:183. 1981. TYPE: UNITED STATES. OKLAHOMA. Kiowa Co.: N slopes of granite mountains S of Lake Altus, 29 May 1957, U.T. Waterfall 13134 (HOLOTYPE: OKLA!; ISOTYPES: GH! KANU, OKL, PH, digital image!).

Waterfall (1971) recognized this entity as related to but distinct from *P. pilosa*. Taylor and Taylor (1981) reduced it to a variety of *P. pilosa*. *Phlox pilosa* subsp. *longipilosa* is endemic to granitic soils in the Wichita Mountains region of southwestern Oklahoma, remote from the main distribution of *P. pilosa* to the east. It is distinguished from the broader *P. pilosa* complex as shown in the following key.

Stems per plant numerous, with 10–18 leaf-nodes; uppermost leaves and bracts alternate, sometimes as many as 7 to 8 being so; inflorescence stems and calyx densely pilose with long jointed hairs mostly 2–4 mm long; calyx-lobes apically bearing relatively long, somewhat twisted awn _____ **Phlox pilosa** subsp. **longipilosa** (Waterf.) Locklear

Stems per plant few, ca. 6–14 leaf-nodes; uppermost leaves and bracts mostly opposite; hairs of upper stems and calyx less than 1 mm long; calyx-lobes aristate _____ **Phlox pilosa** sensu lato

Phlox richardsonii subsp. **borealis** (Wherry) Locklear, comb. NOV. BASIONYM: *Phlox borealis* Wherry, *Gen. Phlox*: 126. 1955; *Phlox sibirica* L. subsp. *borealis* (Wherry) Shetler, *Rhodora* 65:220. 1963; *Phlox sibirica* L. var. *borealis* (Wherry) B. Boivin, *Naturaliste Canad.* 93:1062. 1967. TYPE: UNITED STATES. ALASKA: Nome, Alaska on Anvil ridge, altitude 500 ft, slope 20%, moisture fair, rocky loam, associated plants *Epilobium*, *Salix reticulata*, *Cassiope tetragona*, *Anemone multiceps*, 23 Jun 1929, W.B. Miller 121 – c (HOLOTYPE: US!).

Hooker (1838) described *P. richardsonii* from type material collected by John Richardson while serving on Captain John Franklin's Second (1825–1827) Overland Expedition to the Arctic (HOLOTYPE: K; ISOTYPES: BM, digital image! GH! NY, internet image!). Richardson collected the type in 1826 near Cape Bathurst on the Arctic seacoast of northwest Canada.

The identity of *P. richardsonii* has long been tied up with that of *P. sibirica*, described by Linnaeus (1753) from original material collected in “Asia boreali,” most likely in southern Siberia. Although Hooker (1838) considered the two species distinct, he identified specimens of *P. richardsonii* collected in 1826 by Lay and Collie at Kotzebue Sound on the Alaskan coast as *P. sibirica*, noting the plants differed “in no respect” from material collected in Asia. The treatment of phloxes from the North American Arctic as *P. sibirica* continued well into the twentieth century, as exemplified by the works of such notable students of the Arctic flora as Porsild (1939a, 1939b) and Hultén (1948, 1968).

Wherry (1955) separated the phloxes of the North American Arctic from *P. sibirica*, recognizing *P. borealis*, *P. richardsonii* subsp. *alaskensis*, and *P. richardsonii* subsp. *richardsonii*. Major morphological differences cited by Wherry are reflected in the key below. Not noted by Wherry are significant ecological differences, *P. sibirica* being associated with mid-elevation, graminoid-dominated steppe communities, primarily in the cold, dry interior plateaus of Middle Asia (Ermakov et al. 2002, 2006; Grubov 2001; Knyashev et al. 2007; Krasheninnikov 1937; Mirkin et al. 1985; Peshkova 1972, 2001; Sochava 1945; Yurtsev 1963, 1967, 1972), and *P. richardsonii* occurring almost entirely above the Arctic Circle in association with alpine dwarf-shrubland and alpine herb communities.

Plant an upstanding suffrutescent perennial, sparingly and diffusely branched, forming tufts 8–15 cm tall from a taproot, the erect-ascending flowering shoots 5–10 cm long with ca. 5 leaf-nodes below the inflorescence;

leaves linear, long-acuminate, sometimes falcate, thinnish, maximum length 30–60 cm; inflorescence (one-) three- to six-flowered, maximum pedicel length 20–40 mm; ovary/capsule typically with 2 ovules/seeds per locule _____ **Phlox sibirica**

Plant a caespitose perennial herb forming loose to dense mats 3–12 cm tall from a short-branched caudex, the flowering shoots 2–6 cm long; leaves linear to subulate, maximum length 5–15 mm; inflorescence one- to three-flowered, pedicel length 1–8 (up to 25) mm; ovary/capsule typically 1 ovule/seed per locule _____ **Phlox richardsonii** complex

Phlox richardsonii is recognized here as a complex of intergrading forms largely limited to the western North American Arctic, differing morphologically in stature and size of floral parts and occupying distinct floristic regions of the Arctic. As shown in the key below, three subspecies are recognized here under the first-published name of *P. richardsonii*, necessitating the new combination of *P. richardsonii* subsp. *borealis*.

KEY TO THE SUBSPECIES OF *PHLOX RICHARDSONII* HOOK.

1. Longest pedicels (4–)8–25 mm long; corolla-lobe 8–14 mm long; styles 7–12 mm long; associated with coastal areas of the Bering Strait _____ subsp. **borealis** (Wherry) Locklear
1. Longest pedicels 1–6 mm long; corolla-lobe 6–9 mm long; styles 4–8 mm long.
 2. Leaves flattened, thinnish, 8–15 mm long; pubescent with rather coarse hairs; calyx 7–10 mm long; corolla-limb diameter up to 2.2 cm; associated with higher interior foothills and mountains of Alaska, Yukon, and the Northwest Territories _____ subsp. **alaskensis** (Jordal) Wherry
 2. Leaves awl-shaped, thickish, 5–10 mm long; pubescent with fine, arachnoid hairs; calyx 5–7 mm long; corolla-limb diameter ca. 1 cm; associated with the Arctic seacoast _____ subsp. **richardsonii**

The distribution of the *P. richardsonii* complex ranges from the Bering Sea region of Alaska east to northwest Canada, mostly north of the Arctic Circle, with a few highly limited occurrences reported from Asia. The first-described expression (subsp. *richardsonii*) is known from relatively few stations in northwest Canada and northern Alaska. The core of its range is along the Arctic seacoast of Canada, from Cape Bathurst in the District of Mackenzie of the Northwest Territories, east to Clifton Point, a mainland promontory on the coast of Nunavut Territory. It also occurs on Banks Island of the Canadian Arctic Archipelago. Floristic and ecological literature pertaining to subsp. *richardsonii* (generally as *P. richardsonii*) includes these: Aiken et al. 1999; Freedman et al. 1990 (as *P. sibirica*); Holm 1922; Johansen 1924; Kuc 1974, 1996; MaCoun & Holm 1921.

Phlox richardsonii subsp. *alaskensis* occurs in the higher interior foothills and mountains of Alaska, Yukon, and the Northwest Territories. It occurs most abundantly in the Brooks Range of northern Alaska, but also in the Alaska Range of central Alaska and in the Mentasta, Nutzotin, and Wrangell mountains in south-central Alaska. It also occurs in the Ogilvie Mountains and Richardson Mountains of the Yukon Territory. Floristic and ecological literature pertaining to subsp. *alaskensis* includes these: Carlson et al. 2006a (as *P. alaskensis*); Cody et al. 2002 (as *P. alaskensis*); Cook & Roland 2002 (as *P. richardsonii*); Cooper 1989 (as *P. sibirica*); Drew & Shanks 1965 (as *P. sibirica*); Jordal 1952 (as *P. alaskensis*); Juday 1989 (as *P. sibirica*); Porsild 1972 (as *P. alaskensis*); Spetzman 1959 (as *P. sibirica*); Walker et al. 1989, 1991, 1994 (as *P. sibirica*).

Phlox richardsonii subsp. *borealis* is distributed along the coast of the Seward Peninsula of northwest Alaska, in the vicinity of the Bering Strait. It also has been reported (as *P. alaskensis*) on the Asiatic side of the Bering Strait in the far southeastern portion of the Chukotka Peninsula of the Russian Far East (Balandin & Razzhivin 1980; Razzhivi 1986, 1994). On American side of the Strait, occurrences of *P. richardsonii* subsp. *borealis* are known from coastal areas of Norton Sound and Kotzebue Sound, and from Cape Krusenstern, Cape Lisburne, Cape Prince of Wales, Cape Sabine, and Cape Thompson. Floristic and ecological literature pertaining to subsp. *borealis* includes these: Carlson et al. 2006b (as *P. alaskana*); Hansen 1951 (as *P. sibirica*); Hutchison 1934 (as *P. sibirica*); Johnson et al. 1966 (*P. sibirica*); Kelso 1989 (as *P. sibirica*); Muir 1917 (as *P. sibirica*); Porsild 1939a, 1939b (as *P. sibirica*); Razzhivin 1986, 1994 (as *P. alaskensis*); Shetler 1963 (as *P. sibirica* subsp. *borealis*).

The geographic distribution of these subspecies show parallels with patterns of speciation in the genus *Douglasia* (Primulaceae) (Kelso 1992; Kelso et al. 1994). It also roughly corresponds to the extent of three

floristic subdivisions of the Arctic described by Yurtsev (1994), each reflecting regional differences in environment and climate. Subspecies *richardsonii* is associated with the *Central Canada* subprovince, which is markedly continental. Subspecies *alaskensis* is associated with the *North Alaska* subprovince, which encompasses the more continental parts of the Brooks Range and its northern foothills, the Richardson Mountains, and the Arctic slope of Alaska with its cold, true Arctic climate, a region which experiences colder winter temperatures than coastal areas but also experiences more summer heat and dryness. Subspecies *borealis* is associated with the *Beringian Alaska* subprovince, which encompasses the Alaskan coast of the Bering Strait, notably the Seward Peninsula and coastal areas of Kotzebue Sound, Norton Sound, and the Chukchi Sea. This subprovince has an oceanic climate due to the influence of a warm sea current. While the summer climate along the Bering Strait is generally colder, windier, and more overcast than continental areas of Alaska, the overall climate is less harsh than in the interior mountains due to the proximity of the sea. Species *borealis* also occurs on the Asiatic side of the Bering Strait on the coast of the Chukotka Peninsula in the parallel *Beringian Chukotka* subprovince. A number of vascular plants are considered “Beringian”—characteristic of or endemic to the Bering Sea region on both the American and Asiatic sides of the Strait (Kelso 1987, Yurtsev 1994), with the floras of these coastal areas being more diverse than that toward the interior (Kelso 1989).

***Phlox subulata* L. subsp. *setacea* (L.) Locklear, comb. et stat. NOV. BASIONYM:** *Phlox setacea* L., Sp. Pl. 1:153. 1753; *Phlox subulata* L. subsp. *eu-subulata* Brand var. *setacea* (L.) Brand, Pflanzenr. (Engler) 4(250):78. 1907. LECTOTYPE, designated by Reveal et al. 1982: “*Lychnidea Blattariae accedens Virginiana Camphoratae...*” in Plukenet, Phytographia: table 98, fig. 3, 1691; *Almagestum botanicum* 233. 1696; ΤΥΠΟΤΥΠΕ, designated by Reveal et al 1982: Herbarium Sloane 90: 59 (BM-SL).

Linnaeus established the name *P. setacea* in *Species Plantarum* (1753) based on a figure (table 98, figure 3) published in Plukenet’s *Phytographia* (1691). The epithet *setacea* was subsequently misapplied by Curtis (1798) in the *Botanical Magazine* for what was an illustration and description of *P. nivalis* (Loddiges 1823; Sweet 1827) and the two names became entangled until Wherry (1929, 1937) sorted out the confusion and reinstated *P. nivalis*. Wherry (1929) interpreted *P. setacea* as a glabrate expression of *P. subulata* and later (1955) placed the Linnaean name in synonymy under *P. subulata* subsp. *subulata*. Reveal et al. (1982) located a pertinent specimen in the Sloane Herbarium of the Natural History Museum, London (BM-SL), which they recognized as the tyyotype of the Plukenet figure. Noting that the specimen clearly matched the attributes of what Wherry (1929) treated as *P. subulata* var. *australis*, Reveal et al. (1982) demonstrated that the Linnaean epithet *setacea* has priority over *australis*, and resurrected *P. subulata* var. *setacea*, a name proposed by Brand (1907). This taxon is recognized here at the rank of subspecies.

***Phlox villosissima* (A. Gray) Small subsp. *latisepala* (Wherry) Locklear, comb. NOV. BASIONYM:** *Phlox pilosa* L. subsp. *latisepala* Wherry, Gen. Phlox 47. 1955. TYPE: UNITED STATES. TEXAS. KEIT CO.: 1600–2000 ft, 19–25 Apr 1894 A.A. Heller 1641 (HOLOTYPE: MO; ISOTYPES: G, GH! NY, internet image! PH, digital image! US!).

Gray (1870) described *P. drummondii* var. *villosissima* from type material collected by Charles Wright in 1851 on the “Pebbly bars of the Nueces [River]” in southern Texas (HOLOTYPE: GH!). Small (1903) elevated it to species rank, but still considered *P. villosissima* an annual like *P. drummondii*. Whitehouse (1935) relocated the likely site of Wright’s collection by searching crossings of the Nueces River near Uvalde, Texas where she found “numerous plants that closely matched the type” growing in the chalky gravel beds of the river and determined that the entity is a perennial rather than an annual, providing further merit for recognition as a species. Wherry (1955) recognized the distinctiveness of this taxon, but treated it as *P. pilosa* subsp. *riparia*.

Levin (1968) reinstated *P. villosissima* as a species distinct from *P. pilosa*, reproductively isolated by ecology, flowering season, and incompatibility barriers. Levin initially supported his view with evidence from karyology (Levin 1966; Smith & Levin 1967) and experimental crosses (Levin 1966). *Phlox villosissima* is a tetraploid ($2n = 28$) and appears to be an allotetraploid. These data, coupled with those from studies of seed protein chemistry (Levin & Schaal 1970) and plant pigment (flavonoid) chemistry (Levy & Levin 1971, 1974) indicate *P. villosissima* could be the stabilized derivative of past hybridization between *P. pilosa* subsp.

pilosa and *P. drummondii* subsp. *mcallisteri*. Evidence from more recent molecular studies generally support this hypothesis but also indicate more complicated relationships (Ferguson et al. 1999; Ferguson & Jansen 2002).

Elias Nelson (1899) described *P. aspera* from type material collected by Amos Arthur Heller in central Texas. Brand (1907) discerned a relationship with *P. villosissima*, treating the taxon as *P. drummondii* subsp. *drummondii* var. *villosissima* subvar. *aspera*. Wherry (1955, 1966) also recognized a close relationship between the two, but, as with *P. villosissima*, treated *P. aspera* as a variant of *P. pilosa*, proposing *P. pilosa* subsp. *latisepala* (Wherry noted Nelson's *aspera* was a homonym and unavailable as a subspecific epithet). Levin (1968) reinstated *P. aspera*, citing the same justifications as for *P. villosissima* and noting the entity occupied an intermediate position between *P. villosissima* and *P. pilosa* in terms of morphology and ecology. Both Levin and Wherry considered the combined range of this pair of taxa to be centered on the Edwards Plateau of Texas, with *P. villosissima*/*P. pilosa* subsp. *riparia* most common in the western portion of the plateau and *P. aspera*/*P. pilosa* subsp. *latisepala* occurring more to the east and north.

Ferguson (1998) cited possible local integration of these two entities with each other and with *P. pilosa* (also noted by Wherry [1966]) as reason for maintaining them at the subspecies level pending further study. In the most recent treatment of *Phlox* in Texas, Turner (1998) combined both under *P. villosissima*. While these taxa may intergrade where their ranges overlap, they show distinctive morphological differences and ecological associations toward the outer portions of the overall range of the complex (see key below). The taxon formerly treated as *P. aspera* and *P. pilosa* subsp. *latisepala* is recognized here as a subspecies of *P. villosissima*, necessitating the new combination.

KEY TO THE SUBSPECIES OF *PHLOX VILLOSISSIMA* (A. GRAY) SMALL

- Plant with well-developed slender woody rhizomes producing multiple erect-ascending stems; stems tending to be branched with nodes rather crowded, 12–25 cm tall; inflorescence herbage densely glandular-pubescent; xeric habitat in western portion of species range, notably riverwash habitat and talus slopes _____ subsp. **villosissima**
- Plant not rhizomatous; stems tending to be simple, moderately stout, 22–45 cm tall; pubescent throughout with pointed hairs, with inflorescence herbage moderately glandular; occurs in more mesic habitat in eastern portion of species range _____ subsp. **latisepala** (Wherry) Locklear

CIRCUMSCRIPTION OF *PHLOX CAESPITOSA* NUTT.

Nuttall (1834) described *P. caespitosa* from type material collected by Nathaniel Jarvis Wyeth in 1833 on the return (eastbound) leg of his first Oregon Expedition (1832–1833). Nuttall described the type locality as “Flat-Head river, on the sides of dry hills,” adding, “Flowering about the 20th of April.” The date “April 22nd” is written on the holotype specimen label (BM) and on isotypes (GH, PH) of *P. caespitosa*. According to Wyeth's journal, 22 April 1833 was the day he departed “Flathead Post,” also called “Flathead House,” a trading post historians place not on the Flathead River but on the Clark Fork River near the present-day town of Thompson Falls in northwestern Montana (Sanders County) (McKelvey 1955). A number of more recent collections of *P. caespitosa* have been made in the vicinity of Thompson Falls.

Wherry (1941, 1955) interpreted *P. caespitosa* as a complex consisting of a taller, open-growing form (subsp. *caespitosa*) occurring at middle elevations in the Rocky Mountains, plus three shorter, more compact expressions (subsp. *condensata*, *platyphylla*, and *pulvinata*) occurring at higher elevations under alpine/subalpine conditions. Cronquist (1959) revised this complex, raising the high elevation forms to the rank of species as *P. condensata* and *P. pulvinata* (incorporating subsp. *platyphylla*) and interpreting *P. caespitosa* as a taller, open-growing species of lower elevations, primarily in *Pinus ponderosa* woodland and savanna.

Wherry (1962, 1965a, 1965b, 1969) took exception with these revisions, considering *P. condensata* and *P. pulvinata* mere high altitude expressions or “ecads” of *P. caespitosa*. However, the ecological divergence of these alpine/subalpine entities from *P. caespitosa* is pronounced, and, following Cronquist, *P. condensata* and *P. pulvinata* are recognized here as separate species.

1. Plant a subshrub, sparingly and diffusely branched, forming open tufts 5–15 cm tall, the erect-ascending flowering branches 2.5–7.7 cm long, with internodes typically apparent; associated with montane woodland, savanna and grassland _____ **Phlox caespitosa**
1. Plant a caespitose perennial herb, growth habit pulvinate, forming more or less compact mats or cushions 2–7.5 cm tall, the flowering shoots 1–3(–5) cm long; associated with alpine or upper subalpine ecological systems.
 2. Plants forming dense, tight cushions, shoots closely packed together; leaves appressed, erect, 5–10 mm long; corolla-tube 6–10 mm long, lobes 3–5 mm long; styles 1.5–3 mm long _____ **Phlox condensata**
 2. Plants forming loose, open cushions, shoots more spreading; leaves not appressed to stem, 6–12 mm long; corolla dimensions larger, the tube 7–14 mm long, lobes 6–7 mm long; styles 2.5–5.5 mm long _____ **Phlox pulvinata**

While bringing this helpful clarification to the *P. caespitosa* complex, Cronquist (1959) unfortunately added confusion by reducing the name *P. douglasii* to synonymy under *P. caespitosa*. These are recognized here as separate species (see discussion of *P. douglasii* that follows).

As circumscribed here, *P. caespitosa* is a species of the Rocky Mountain System, chiefly in the Northern Rocky Mountains in southeastern British Columbia, northern Idaho, and western Montana. It occurs most abundantly in Montana, particularly on the eastern slope of the Bitterroot Mountains and in the intermountain valleys of the Rocky Mountain Trench. It occurs at lower to middle elevations (mostly 800–1500 m, but up to 2040 m) in the piedmont and mountains, and in association with morainal features of river valleys. *Phlox caespitosa* is strongly associated with *Pinus ponderosa* woodland and savanna, but also is common in montane, foothill, and valley grasslands in the region where *Pseudoroegneria spicata*, *Festuca idahoensis*, and *Festuca campestris* are the chief graminoids.

Interpreting floristic and ecological literature in relation to *P. caespitosa* is made difficult by the confused nomenclature surrounding this plant, particularly in connection with the name *P. douglasii* (discussed below), but with added problems coming from the literature of alpine ecology where the name *P. caespitosa* has been misapplied to *P. condensata* and *P. pulvinata*. Literature pertaining to *P. caespitosa* includes these: Lackschewitz 1991; Lesica 2002; Root & Habeck 1972 (as *P. pulvinata*); Shaw & On 1979.

CIRCUMSCRIPTION OF *PHLOX DOUGLASII* HOOK.

Hooker (1838) described *P. douglasii* in his *Flora Boreali-Americana*. As one of the first of the small-leaved cushion-forming phloxes described from western North America, the name *P. douglasii* subsequently served as catch-all for many later-discovered, superficially similar species, a number of which were treated as varieties or subspecies of *P. douglasii* at some point in their nomenclatural histories, including *P. andicola*, *P. austromontana*, and *P. diffusa*. Further confusion was caused by the emergence of the term “Douglasii Hybrids” in horticultural literature in the early 1900s, which was applied to a wide variety of cushion phlox cultivars of probable hybrid origin. Wherry brought much needed clarity to this situation through his papers on the western phloxes (1938, 1941) and his 1955 monograph in which he recognized *P. douglasii* as a distinct species with a distribution centered on the Columbia Plateau in the Pacific Northwest.

Cronquist (1959) reduced *P. douglasii* to synonymy under *P. caespitosa*, justifying this treatment under his discussion of *P. pulvinata* which he separated from *P. caespitosa*. Cronquist described the type of *P. caespitosa* as “a compact plant of the taxon usually known as *P. douglasii*.” Since the name *P. caespitosa* was published by Nuttall (1834) four years before Hooker (1838) published *P. douglasii*, Cronquist reasoned that “the latter name [*P. douglasii*]...must subside.”

Wherry (1962, 1965a) considered this “a serious misunderstanding,” calling *P. douglasii* and *P. caespitosa* “about as distinct species as can exist among the Microphloxes.” Indeed, Wherry (1955) placed these two species in independent subsections of the genus—*Douglasianae* and *Caespitosae*. Despite Wherry’s protests, most subsequent floristic and ecological workers in the Pacific Northwest have followed Cronquist. Based on examination of the type material of both *P. douglasii* (HOLOTYPE: K, digital image!; ISOTYPES: BM, digital image! GH! NY, internet image! PH, digital image!) and *P. caespitosa* (HOLOTYPE: BM, digital image!; ISOTYPES: GH! NY, internet image! PH, digital image!), plus study of these entities in the field (*P. douglasii* in Washington,

Oregon, and California; *P. caespitosa* in Montana), they are recognized here as separate species. As noted by Wherry (1962, 1965a, 1969), the leaves of *P. douglasii* are dark green, slender and needle-shaped (acicular or acerose), and covered by long gland-tipped hairs, while the leaves of *P. caespitosa* are pale green, relatively broad and flat (linear-oblong), thickish, and bear coarse glandless cilia along the margins. The distribution of *P. douglasii* is centered on the Columbia Plateau, while that of *P. caespitosa* is centered in the Northern Rocky Mountains.

Interpreting floristic and ecological literature in relation to *P. douglasii* is made difficult by the confused nomenclature surrounding this species. Prior to Cronquist (1959), this taxon was treated as *P. douglasii* or *P. rigida*, the latter recognized by Wherry (1938, 1955) as a reduced expression of the former under the name *P. douglasii* subsp. *rigida*. Following Cronquist's revisions, most workers abandoned these names in favor of *P. caespitosa*. Literature pertaining to *P. douglasii* includes these: Applegate 1938; Culver 1964 (as *P. diffusa*); Daubenmire & Daubenmire 1968 (as *P. caespitosa*); Driscoll 1964a, 1964b; Eckert 1957 (as *P. diffusa*); Hall 1967; Howell 1903; Munz & Keck 1959 (as *P. douglasii* subsp. *rigida*); Peck 1941; Piper 1906 (as *P. rigida*); Piper & Beattie 1914 (as *P. rigida*); St. John 1937 (as *P. douglasii* var. *rigida*). The following key separates *P. douglasii* from *P. caespitosa* and, additionally, from *P. diffusa*, a similar-appearing species that occurs in range.

1. Leaves pale green, relatively broad (linear-oblong) and flat, thickish, with coarse glandless cilia; Northern and Middle Rocky Mountains _____ **Phlox caespitosa**
1. Leaves dark or bright green, relatively narrow and slender, cilia lacking or fine; mostly west of the Rocky Mountains.
 2. Pubescent with glandular hairs throughout; leaves somewhat acicular (needle-shaped) and stiff, their surfaces pilose to glabrate with fine gland-tipped hairs; primarily dry to xeric habitat on the Columbia Plateau _____ **Phlox douglasii**
 2. Pubescence not glandular; leaves linear (narrow with sides parallel over most of length) to linear-subulate and only moderately rigid; primarily moderate to high elevations along the Cascade/Sierra axis _____ **Phlox diffusa**

CIRCUMSCRIPTION OF *PHLOX MISSOULENSIS* WHERRY

Wherry (1944) described *P. missoulensis* from the type collected by Merton J. Reed in 1939 on Waterworks Hill near Missoula, Montana (HOLOTYPE: PH, digital image!). Cronquist (1959) reduced this entity to *P. kelseyi* var. *missoulensis*, a relationship and reduction with which Wherry (1962, 1965b) strongly disagreed, calling *P. missoulensis* "a striking endemic...wholly unrelated" to *P. kelseyi*. In her thesis on the *P. kelseyi* complex, Campbell (1992) followed Cronquist in treating *P. missoulensis* as a variant of *P. kelseyi* (proposing but not publishing *P. kelseyi* subsp. *missoulensis*), but cited "extremely different habitats" plus "complete geographical isolation coupled with differences in 10 morphological characters" in support of recognition of *missoulensis* as a distinct entity within the *P. kelseyi* complex. *Phlox missoulensis* and *P. kelseyi* are recognized here as separate species (see key below). *Phlox missoulensis* is endemic to the Northern Rocky Mountains in west-central Montana, chiefly along or just west of the Continental Divide where it occurs in the Anaconda, Garnet, Lewis and Clark, and Sapphire ranges and on small mountains in the vicinity of Missoula, with outlying occurrences east of the Continental Divide in the Little Belt Mountains.

Leaves dark green, linear to linear-lanceolate, thinnish but with subacerose tip, ciliate and surficially pilose with fine gland-tipped hairs; exposed mountain slopes and ridges; habitat dry to xeric; soils stony and shallow _____ **Phlox missoulensis**

Leaves pale green, linear-lanceolate, acuminate and cuspidate, thickish and succulent, fleshy (becoming wrinkly on drying), the margin slightly thickened, basally coarse-ciliate, surficially glabrous to moderately pubescent; mountains valleys and intermountain basins and flats; habitat seasonally moist to wet; soils alluvial, fine-textured, alkaline to highly-alkaline _____ **Phlox kelseyi**

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